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INSTRUCTIONS FOR PRACTICE SEAWARDS.

104
Arty.
1754

ROYAL
GARRISON ARTILLERY.



1907-1908.

Applicable up to 1st April, 1908.



GENERAL STAFF, WAR OFFICE.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
BY HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HIS MAJESTY.

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PREFACE.

Instructions for Range Parties and Safety Precautions for Practice have been transferred from G.A.T., Vol. I, to "Instructions for Practice Seawards," where, for convenience of reference, they have been made the last but one, and last chapters.

Of the items hitherto published as Appendices, some have been moved to the chapters to which they specially referred. Of the rest, those specially relating to Class Firing have been placed together in Chapter V, the remainder in Chapter VII.

INSTRUCTIONS FOR PRACTICE SEAWARDS

FOR THE

ROYAL GARRISON ARTILLERY.

NOTE.—Wherever the term *Coast Defence Commander* is used in these instructions it must be understood as referring to the following officers.

At Home—

To the Coast Defence Commander, or, where a Colonel Commanding R.G.A. has been appointed, to that officer.

Abroad—

To the General or other Officer Commanding R.A. in the Command.

CHAPTER I.

GENERAL INSTRUCTIONS.

SECTION 1.—INTRODUCTORY REMARKS.

Garrison Artillery Training, Vol. I, is the basis on which practice seawards is to be conducted, but where differences are found to exist between it and these instructions, the latter while in force will be adhered to.

The general objects of practice may be briefly stated as—

- (1) To train all ranks to make the best use of the guns to which they are for the time being allotted on mobilization.
- (2) To train all ranks for the duties they may be called upon to carry out in war time with the armament, whether for the defence of land or sea fronts, with which they may have to serve in any part of the empire.
- (3) To test the efficiency of the Fortress as a whole, and of the units comprised in it, both as regards personnel and material.

The Annual Allowance of Practice ammunition, whether in money or in kind, is laid down in Equipment Regulations, Part 2, Section XII(a), paras. 123, *et seq.*

All ammunition allowed to Regimental and Company practice is placed at the disposal of Coast Defence Commanders to use as they deem best for training purposes with the following reservations—

(a) Ammunition allowed in quantity must not be commuted except as provided in para. 124 Equipment Regulations, Part 2, Section XII (a).

(b) The ammunition contributed towards Light Q.F. courses at Shoeburyness must be taken from that allowed in quantity for regimental practice.

(c) The requisite ammunition must be set apart for carrying out the Class Firing series laid down in Instructions for Practice Seawards.

(d) Ammunition required for calibrating* guns with reduced charges and for error of day rounds from anti-torpedo boat guns must also be taken from the ammunition placed at the disposal of the Coast Defence Commanders.

Station practice is to be used principally for testing fitness of armaments, equipment, &c., for service, in accordance with para. 123 Equipment Regulations. It may be found possible to combine it with Battle Practice. Careful records should in all cases be kept during this Practice.

Training practice is to be allotted under the following sub-heads:—

(1) Experimental Practice—

(a) For calibrating guns with the charges and projectiles to be used for practice.

(b) Determining periodically the corrections required to be put on the error of day drum of anti-torpedo boat guns (*vide* forthcoming Amendment G.A.T., Vol. I.).

(2) Instructional Practice—

This may be sub-divided into Elementary and Service Instructional Practice.

Elementary Instructional Practice is mainly for the training of individuals, such as specialists, observers, gun captains, Group and Battery Commanders, and for accustoming all ranks to work together.

Service Instructional Practice is chiefly intended for the further instruction of those Companies which, owing to the large proportion of young soldiers in the ranks, or to other causes, are not considered

* By the term calibrating is meant the determining of data for the construction of suitable range strips to compensate for variations in muzzle velocity due to wear of gun, or changes in lot of cordite, largely with the view of obtaining uniform shooting from guns in the same group or battery.

to be in a sufficiently advanced stage of training to go to Class Firing.

(3) Class Firing—

To act chiefly as a test of the training and efficiency of the company and its equipment under service conditions, and to inform the Coast Defence Commander of the fighting value of the guns manned by that Company.

It is dealt with in Chapters II to V.

(4) Battle Practice—

To test the fighting efficiency of the Fortress as a whole or any particular portion of it.

It is dealt with in Chapter VI.

If a Company, or more than half a Company, is allotted to Movable Armament abroad, or Armament for defence of Land Fronts at home, it will carry out the greater part of its practice, including Service Class Firing or Service Instructional Practice, from this armament, in accordance with "Instructions for Practice, Horse, Field, and Heavy Artillery," or "Instructions for Practice, Siege Artillery," as may be applicable. The remainder being carried out as Instructional Practice from Fixed Armament.

Where half the company is allotted to one Armament and half to the other, the Coast Defence Commander will decide as to the Armament from which Class Firing, if the Company proceeds to this form of practice, is to be carried out.

If less than half a Company is allotted to Movable Armament, or Armament for defence of Land Fronts, it should carry out its Class Firing, or Service Instructional Practice, from Fixed Armament, and some Instructional Practice from Movable Armament.

In all cases the Coast Defence Commander will decide as to the proportion of series to be fired from the two natures of Armament.

When movable armament is intended to be used for repelling a landing attack some shrapnel series should be fired over sea at targets representing boats, moving as far as possible in the formation and direction which they would be likely to adopt in war, subject to the limitations which the safety regulations impose. If it is possible to use a towed target the High Speed Target will represent a line of boats under tow, and the practice will be judged and marked as nearly as possible in accordance with "Instructions for Practice, Horse, Field, and Heavy Artillery" at a moving target.

Should it not be possible to arrange for a towed target, a drifting target, or anchored targets, representing successive positions of an advancing boat, should be used.

The system of marking should follow that in "Instructions for Practice, Horse, Field, and Heavy Artillery" as closely as possible.

These series will not be included in Class Firing.

The Lieut.-Colonel will be present during the whole of the practice, except Elementary Practice, carried out by the Companies under his command.

SECTION 2.—ELEMENTARY INSTRUCTIONAL PRACTICE.

Most of the objects of Elementary Practice can be obtained by means of aiming tube, aiming rifle, and sub-calibre practice, but where possible a few series with service ammunition from the lighter natures of guns should be fired to accustom recruits and young soldiers to the firing of guns. Every layer should, if possible, fire a few rounds with service charges.

Elementary Practice should be carried out under the Commanding Officer of the Company, and the greater part of it during the Company Course, but it is desirable to reserve a certain amount of ammunition for the training and periodical testing of gun layers and other specialists.

Elementary Practice should be graded from simple series from a single gun, for the purpose of training individuals, to practice from a group or battery under conditions approaching those of actual service. Casualties should be practised during the later stages of this practice.

The Lieut.-Colonel Commanding will furnish, as the result of his own personal inspection of the Company, and from what he has seen of its training and Elementary Instructional Practice, a report in his own handwriting to the Coast Defence Commander, for each Company under his command, as regards its general state of efficiency to carry out practice. This report should include full information as to:—

- (a) Capabilities of the Officers as regards their duties as B.C., G.G.C., &c., &c.
- (b) Efficiency of the N.C.Os and men as regards all duties required of them, specifying the guns with which they are acquainted.
- (c) Capabilities of the range finding specialists, dial numbers, observers and recorders.
- (d) Efficiency of the gun layers as shown by the last examination under the tests laid down, and giving the number that he considers qualified.
- (e) Whether laying instruction and keeping records of layer's tests has been properly carried out.

(f) Whether the Company Officers understand how to make out Practice Reports.

The Lieut.-Colonel will finally state whether he recommends that the Company should carry out Class Firing or not.

Unless 10 per cent. of the strength of a Company are qualified gun layers (exclusive of any serjeants or corporals who may be so qualified), the Lieut.-Colonel Commanding will not, as a rule, recommend that it should carry out Class Firing; should he do so, the special reasons for this course must be fully stated.

The Coast Defence Commander will add to the certificate his concurrence in, or dissent from, the Lieut.-Colonel's recommendation, and Class Firing will be carried out, or not, according to his ruling. The certificate will be affixed to the Practice Report of the Company.

No partial certificate can be admitted; a Company not considered entirely fit for Class Firing will not carry out this form of practice.

A Company not considered fit to carry out Class Firing will carry out in lieu of it such Instructional Practice as the Coast Defence Commander may deem advisable, having regard to the Company's state of training. The Lieut.-Colonel will submit a scheme of practice for the approval of the Coast Defence Commander. The practice will consist wholly or in part of Service Instructional Practice.

SECTION 3.—SERVICE INSTRUCTIONAL PRACTICE.

This practice should be carried out with the same strictness as regards service conditions as Class Firing, but the conditions as regards ranges and targets may be made easier to suit the state of training of the Company.

A series should be stopped at any moment by the Officer superintending for the purpose of pointing out mistakes, or preventing waste of ammunition.

If necessary in the opinion of the Superintending Officers, companies may be relegated to further Elementary Practice.

Service Instructional Practice should be carried out under the Lieut.-Colonel Commanding.

The keeping of records, compiling and disposal of practice reports, and criticisms of practice will be carried out on the general lines laid down for Class Firing in Chapters III and IV.

The Coast Defence Commander in forwarding the Practice Reports will state his views as to the gain derived by the Company from the practice.

CHAPTER II. CLASS FIRING.

SECTION 4.—GENERAL.

Practice under this head will not take place until the Company Course has been completed. It will be carried out as nearly under service conditions as possible.

Coast Defence Commanders may authorise the use of departures from hand-book drills, if they have been previously submitted for their approval. These departures must not include a breach of safety regulations nor the employment of unauthorised numbers in the service of the gun. Variations in drill found satisfactory should be reported to the Commandant, School of Gunnery.

Should it be deemed advisable to deviate in any particular from the instructions governing Class Firing, application must be made to the Commandant, School of Gunnery, in sufficient time for his decision to arrive before the date fixed for practice.

No firing will count for Class unless it takes place from the guns and works which the Company mans on mobilization; except that Companies allotted to heavy and medium guns that cannot be fired in peace, may practice from other guns belonging to the armament of the command; and Companies allotted to light Q.F. guns under similar circumstances may practice from these guns after they have been moved to positions from which firing is permitted, should such procedure be practicable.

Where facilities exist for carrying out service practice by night, all Class Firing from light Q.F. guns should be by night, and where facilities exist some series from medium and even heavy guns up to 9.2" B.L. should also be fired by night.

Whenever Class Firing is carried out from a battery command to which the Company firing is allotted on mobilization, the whole battery command will, as far as possible, be fully manned in every detail as on mobilization, and prepared for action. Intimation as to the groups from which practice will be carried out will be given to the B.C. on parade after preparation for action.

For night practice, works will be manned, and all preparations for action made, before sunset.

SECTION 5.—NATURE AND NUMBER OF SERIES.

In Class Firing a series consists of a certain number of rounds fired at a target whose course is intended to represent the continuous movement of an attacking ship.

(1) All Companies must carry out at least three series from heavy and medium guns of the armament and two series from light Q.F. guns.

Where 4·7-inch guns are used for defence against torpedo boats, they may be treated as light Q.F. guns in all respects.

Except as provided by the following paragraph, only one series should as a rule be fired in one day, and never more than two; when two series are fired in one day the second must be from a different work or nature of gun.

One series at least should be carried out from more than one group in a battery command. Where restrictions as to the amount of ammunition available and compliance with the instructions as to the minimum number of series to be fired render it necessary, this may be reckoned as two series.

If from local conditions it is impossible to carry out practice from more than one group, an explanation to this effect from the Coast Defence Commander should be attached to the Practice Report.

Whenever local circumstances admit, part of the Class Firing should consist of combined practice from two or more works in a Fire Command, manned by all the Companies allotted to them, and with the Lieut.-Colonel, or other officer detailed on mobilization, acting as F.C.

The exigencies of peace practice and economy of ammunition may not allow of more than one group in each battery command being used for practice, or of practice being carried out simultaneously from all the works in the Fire Command, but, if possible, each Company in the Lieut.-Colonel's Command will practice from at least one group in one of the works of the Fire Command and the remainder of the works will be manned up to the strength of the Company in accordance with the mobilization manning tables.

It may not be possible for all the works to fire continuously throughout the whole run, but the course should be selected so as to represent a continuous action.

The rounds fired by each Company taking part in it will constitute one of its series for Class Firing. The average of the figures of effect so counted will be the figure of effect for the Fire Command.

All Officers, N.C.Os, specialists, and men of the Com-

pany, are to be employed as far as possible during the various series, and, except as regards the Major and Captain, an equal number of times. Ammunition details will not be considered as having been employed in a series.

When both rocking bar and automatic sights are in use on the same gun an extra layer and a setter are required. If this layer and setter be found from the detachment their place therein must be filled from the reserve. No increase to manning details can be allowed.

Observers to assist the B.C. are often necessary, and should always be provided. Officers would not be available for this purpose in war, and are not to be used for it at practice.

Every officer of a Company should act during the various series, either as B.C., or as G.G.C. of a light Q.F. group. In allotting series, regard must be had to rank of officers and their responsibilities on mobilization.

One of the series should be fired with fuzes. In this series the removal of caps or safety pins should be checked by the Umpire Staff.

One of the series from heavy and medium guns will, when practicable, be fired wholly or partly by Case III.

Another of these series will involve a change from Case II or rocking bar sights to automatic sights; the Chief Umpire arranging so that about half of the rounds are fired with auto-sights. This latter provision is not, however, to cause the series to be broken up into two distinct parts.

Casualties will be made by the Chief Umpire before the commencement of and during a series, both to personnel and material. They will be made in such a way as to test the ability of the manning detail to carry out the practice by any of the means of laying and range finding available, and after suffering moderate loss in personnel.

No allowance of time will be made for replacing casualties, nor will previous intimation be given.

Casualties, and the times at which they occurred, are to be recorded in practice reports.

A sufficient supply of ammunition should be available at each gun to allow of all the rounds allotted to a series being fired in spite of one or more guns going out of action. In the case of a gun firing its proportion of rounds before other guns have fired theirs, the additional rounds provided for it may be made use of so as to keep it in action until the total number of rounds allotted to the series has been fired. The Chief Umpire must take steps to prevent more than the allotted number of rounds being fired in the series.

Example :—A series is being fired from a group of two 6-inch B.L. Mark VII guns. The ammunition allotted would be 24 rounds. That number of rounds should be readily available for each gun, so that in the event of one gun being out of action, the series could be fired by the remaining gun.

For light Q.F. guns the number of rounds allotted per gun for a series is not to exceed the number which can be fired in one minute at the rate laid down in Table 2, page 32.

For 4.7-inch Q.F., 6-inch Q.F., and 6-inch B.L. Mark VII the number of rounds allotted per gun for a series is not to exceed the number which, according to the rate of fire laid down in Table 2, page 32, can be fired in two minutes.

For all other guns no more than eight rounds per gun are to be allotted.

SECTION 6.—TIME.

No time limit will be fixed for a series, but the Chief Umpire is empowered to bring it to a conclusion before all the rounds allotted have been expended, when owing to the series lasting an unreasonable time, or for other reasons, he considers it advisable to do so.

When the Chief Umpire orders a series to stop, he should give his reasons for doing so in his remarks on the series.

The gross time of the series will be from the "*Continue*" sounding until all the rounds allotted to the series have been fired from the group, or until the Chief Umpire orders it to cease.

Where more than one group of guns of a similar nature is engaged in a series, the gross time will be the mean of the times the groups were in action. When guns of different natures are engaged in a series, the time for each nature will be calculated separately.

After allowances for ranging or other causes have been deducted from the gross time, the result will be the nett time of the series.

With heavy and medium guns the Chief Umpire will deduct from the time of a series an allowance for the delay necessarily incurred in ranging.

This allowance will be calculated for each series as laid down in Chapter V, Section 17, page 28-31, and will only be made if ranging has actually been carried out, and by deliberate fire.

The Chief Umpire may also deduct allowances of time in the following cases :—

- (a) When guns are actually delayed by smoke obscuring the range, and the B.C. has considered this point in selecting his position for fighting the guns, and the flank from which fire should open.
- (b) For delays due to causes obviously not the fault of the Company, but no time allowance will be given for a missfire.

In making ranging and other time allowances the effect of any delay on the combined fire effect of a series is to be considered, and only such time deducted as is equivalent to this. *The actual delays, the amounts allowed, and the reasons for the allowances are to be stated in practice reports.*

No time allowance is to reduce the time of a series below that required, according to Table 2, page 32, to fire the rounds actually expended.

The Commandant, School of Gunnery, may disallow or modify any allowance made.

SECTION 7.—TARGETS.

Class Firing will always be carried out at towed targets, except in the case of high angle fire guns which may be fired at an anchored target.

Towed targets will consist of two service targets joined together with a distance of 200 feet between the outer edges of the superstructures for heavy and medium guns, and of 100 feet for light Q.F. guns.

For Q.F. and 6-inch B.L. Mark VII guns, winding-in gear will, when available, be used to tow targets. The speed will be the highest attainable, except that with medium guns the Chief Umpire may order the reduction to not less than 12 knots.

SECTION 8.—HITS WITH TOWED TARGETS.

With towed targets the following will be the methods of recording the fall of shots and scoring hits :—

The Umpire for line will record as "*line*" all rounds falling *between the outer edges* of the superstructures of the targets. All other shots will be recorded as "*Right*" or "*Left*." If one of the targets is shot away, and the Chief Umpire elects to carry on without replacing it, the remaining one will be treated as the leading target, and the Umpire will

estimate whether rounds would be "line" were there a second target.

The Umpire for range will estimate, by means of one of the rakes described in Chapter IX, Section 29, the distance each round falls short of, or over the towed targets, and will record it in his Range Report.

In the Practice Report he will insert a certificate that he used the rake for this purpose.

Every round "in" for line, that would be, according to the angle of arrival at the mean range of the series, a ricochet or direct hit on the prescribed imaginary target, will score a hit.

For heavy and medium guns when restricted water area, or reasons of safety, necessitate the reduction of the mean range of a series below the minimum laid down in Table I, page 19, the target to be considered will be a vertical one of height equal to three times the 50 per cent. vertical zone of the gun for the mean range fired at. In all other cases the imaginary target for heavy and medium guns will have a height of 30 ft. and beam 60 ft. For light Q.F. guns the imaginary target will have a height of 4 ft. and beam 9 ft.

The nearer side of the imaginary target will be taken as being on the line of the towed targets.

The table of "permissible errors" for the gun, as sited, and charge used, will be employed to determine which shots are in for range; in exceptional cases special calculations must be made and attached to Practice Reports. For tables of permissible errors see Chapter V, Section 19.

When more than two Q.F. or 6-inch B.L. Mark VII guns fire at the same target the following method may be used:—

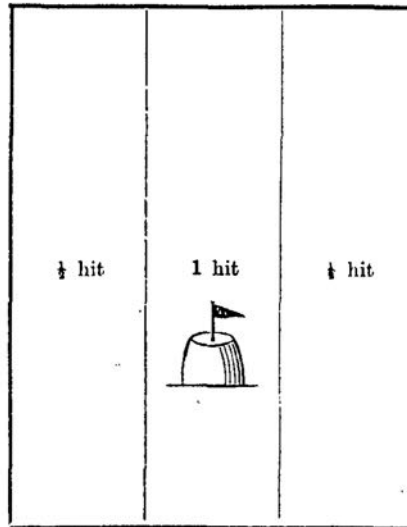
From the records of the Umpires for range and line are obtained the number of rounds "in" for range and the number of rounds "in" for line. These numbers are then multiplied together and divided by the total number of rounds fired, and the result is taken as the number of hits obtained.

Example:—84 rounds, 60 "in" for line and 40 "in" for range.

$$\text{Hits obtained} = \frac{60 \times 40}{84} = 28.5$$

When using this method it is best for the Umpire for range to neglect all rounds falling outside his rake, and for the Umpire for line to note only rounds "out" for line.

SECTION 9.—HITS WITH ANCHORED TARGETS.



With anchored targets the Chief Umpire will make suitable arrangements for recording the fall of shots.

The target will be supposed to be on the centre line of a rectangle, and three-eighths of the length of the rectangle from the end nearest the battery.

The length of the rectangle will be four times the 50 per cent. length zone of the gun at the range of the target, the breadth will be twelve times the 50 per cent. breadth zone. The length zone will be corrected for height of battery.

The rectangle will be divided longitudinally into three equal parts. Shots falling in the middle rectangle score one hit, and in the outer rectangles half a hit.

SECTION 10.—RANGES.

Range should vary as much as practicable during a series.

The *mean range* of a series will be determined as follows:

- (a) If possible by recording the range at which each round was fired, as measured by range finder and corrected when necessary for displacement, and by then calculating the mean of all these ranges.

- (b) If the range cannot be recorded for each round, and the series is not interrupted, then the ranges at which fire opened and ceased will be noted in the practice report, and the mean of these ranges will be taken.
- (c) If the range cannot be recorded for each round and the series is interrupted in any way, then the mean range of each portion will be found as in (b). The mean range of each portion will then be multiplied by the number of rounds fired during it, the amounts thus obtained will be added together and divided by the total number of rounds fired during the series, and the result will be the mean range of the series.

Minimum mean ranges for Heavy and Medium guns are given in the following table:—

TABLE 1.

	Mean Range for Class Firing must not be less than—
	Yards.
5-in. B.L.	3,700
6-in. B.L. Marks IV and VI $\frac{1}{2}$ charge ..	3,800
6-in. B.L. Mark VII $\frac{1}{2}$ charge	3,600
6-in. B.L. Marks IX and X	5,000
9·2-in. B.L. Marks III to VI	5,800
9·2-in. B.L. Marks IX and X $\frac{1}{2}$ charge ..	6,000
10-in. B.L. $\frac{1}{2}$ charge	3,400
4·7-in. Q.F.	4,600
6-in. Q.F.	4,300

With low-sited batteries, however, for which the above limits are greater than the effective limits of auto-sights, series, or portions of series, for which auto-sights are used, should, if possible, be made to commence just inside the limit of auto-sights. The first portion of a series in which a change is made to auto-sights under these conditions should be outside the effective limit of auto-sights, but at a range which will allow of the whole series being consecutive.

With light Q.F. guns the range is never to be less than 600 yards, and should not, as a rule, exceed 2,000.

For night practice the ranges should not be longer than those at which targets can be clearly seen.

SECTION 11.—FIGURE OF EFFECT.

The number of hits obtained in a series, divided by the nett time of the series and the number of guns, gives the "hits per gun per minute obtained."

The highest number of rounds probable per gun per minute according to Table 2, page 32, combined with the percentage of hits probable, gives the "highest number of hits per gun per minute probable." This for brevity will be called "hits per gun per minute probable."

The percentage of hits probable in a series will be that corresponding to the mean range of the series, and will be calculated in accordance with Section 19, page 33.

The figure of effect of a series = $\frac{\text{Hits per gun per minute obtained.}}{\text{Hits per gun per minute probable.}}$

When more than one nature of gun is used in a series, a figure of effect will be worked out for each nature, and the mean of these figures will be the figure of effect of the series.

SECTION 12.—CLASSIFICATION OF COMPANIES.

The Commandant, School of Gunnery, has assigned standard figures of effect for the individual groups of each work for which records of practice exist. Coast Defence Commanders will forward at the close of the Class Firing for the year, suggestions as to any groups whose standards they consider should be altered, or for which none has yet been assigned.

The ratio which the figure of effect in any series, less any penalty inflicted, bears to the standard figure, will be the figure of merit for that series.

The figures of merit for heavy and medium gun series will be added together and divided by the number of the series; the figures of merit for light Q.F. series will be added together and divided by the number of series. The results will be the figures of merit for heavy and medium guns and for light Q.F. guns respectively.

The figure of merit of the Company is obtained by multiplying the figure of merit for heavy and medium guns by two, adding the figure of merit for light Q.F. and dividing by three.

The figure of merit of a Company will not be published, but will be communicated to the C.D.C. for the information of those concerned.

The figures of merit necessary to qualify for classes will be as follows:—

1st Class	..	..	..	0·7
2nd „	..	..	..	0·6
3rd „	..	..	..	0·5

The Coast Defence Commander may inflict such penalty as he thinks fit in any series for bad fire discipline or dangerous mistakes, or he may totally disqualify a Company.

The Commandant, School of Gunnery, may inflict penalties at his discretion.

SECTION 13.—CLASS BADGES.

All Companies qualifying as first class will be awarded badges to be worn by all the N.C.Os and men of the Company.

Companies qualifying as second or third class are not awarded badges.

The badge will be crossed guns and a crown worked in gold.

The Clothing Depot supplying the District will supply the badges on receipt of indent from the Officer Commanding, supported by a certified extract from District Orders.

The badges will be worn until the next year's awards are published in the District.

CHAPTER III.

CLASS FIRING—CONDUCT OF PRACTICE.

SECTION 14.—UMPIRES.

Practice will be carried out under the orders of an Officer appointed as Chief Umpire, who will be responsible for the course of the target, safety of the range, making casualties, time keeping, and keeping the records necessary for Practice Reports, and also for awarding credits, and for the accuracy of Practice Reports.

Umpires will be detailed under the authority of the Coast Defence Commander. The Chief Umpire should be the Coast Defence Commander or a Chief Instructor of the School of Gunnery. The same Umpires, as far as is practicable, should act for all the Companies of a District.

It is not desirable that the *Lieut.-Colonel Commanding* the Companies practising should act as Chief Umpire, unless it is not practicable to obtain the services of an Officer senior to the *Lieut.-Colonel*.

The Chief Umpire will decide whether the weather is fit to carry out practice, and no claims or objections on this point will be allowed.

He is responsible that the Officers, N.C.Os, and men are employed during practice in accordance with Chapter II, Section 5.

The Chief Umpire will have the power to stop a series if its continuance should appear to him likely to result only in waste of ammunition.

The Chief Umpire will have as assistants:—

An Officer as umpire for line.

An Officer with the range party as umpire for range, who should not belong to any of the companies firing.

An Officer, if available, on the gun floor as umpire for drill, to note mistakes in drill and fire discipline.

Recorders, with stop watches as required, to record times of firing and giving orders, rotation of fire, B.C.'s orders, state of tide, setting of tide levers, and all other information needed to compile practice reports. Unless such information can be correctly obtained, the causes of faulty rounds cannot be traced, nor can the practice be usefully criticised.

Recorders require careful training, especially in noting ranges on guns and dials, group differences, &c. Gun drill parades and aiming rifle practice should be used for this purpose. Lieut.-Colonels must ensure there being enough sufficiently well trained recorders in their command to keep all necessary records, and to do so without hampering the practice. B.Cs must as far as possible facilitate the collection of records.

The Chief Umpire and his staff will wear a white band on the right arm above the elbow.

Safety precautions are dealt with in Chapter X, page 56.

SECTION 15.—CONDUCT OF PRACTICE.

Error of day rounds will be fired in accordance with G.A.T. Vol. I., as amended, and not as a preliminary to or in connection with any special practice.

When the B.C. or G.G.C. has reported to the Chief Umpire that his battery or group is ready for action, the Chief Umpire will signal to the tug to start on course. Directly the flag on the tug is up, the B.C. should indicate the target to G.G.Cs and range-takers. Layers will then follow the target as laid down in G.A.T., Vol. I.

After a short interval, if the range is clear, the Chief Umpire will sound the "*Double*," followed after a second short interval by the "*Continue*" (or give the equivalent orders). The "*Double*" is a signal for the B.C. to order "*Action*," the "*Continue*" one for him to open fire.

The time will be taken by the Chief Umpire, or his time-keeper, from the "*Continue*" until the ammunition is expended, or until the series is ordered to cease, when "*Stand Fast*" will be sounded or ordered. At this order the stopwatch will be stopped, guns will immediately be made safe by order of the G.G.C., and all ranks will stand fast.

If it is necessary to sound "*Stand Fast*" during a series, the procedure will be as above, with the following exceptions:—(a) When a bare cartridge has been withdrawn from its cylinder it will be replaced, except that with B.L. guns, if the projectile is home the cartridge may be placed in the chamber.

(b) To enable fire to reopen without warning on the "*Continue*" sounding, the Chief Umpire will intimate to the B.C. that ranges may be passed and laying may continue.

With these exceptions no work may proceed. Failing instructions from the Chief Umpire, the "*Stand Fast*" will be absolute, except that guns will be made safe. A gun

which has missed fire will not be made safe at "*Stand Fast*," but will be kept traversed in a safe direction.

In the case of a long wait, the Chief Umpire may direct the B.C. to order his men to sit at ease under cover. To enable them to resume the positions in which they were at "*Stand Fast*," the B.C. will order them to take post. "*Action*" will not be given except at the commencement of a series.

At light Q F. practice the Chief Umpire will intimate to the group, by signal or by word of mouth, that firing may commence and time will then be taken, or at night, if safety arrangements permit, orders may be given beforehand that fire is to commence on the target entering the illuminated area. "*Stand Fast*" may be given by whistle or bugle sound.

When the leading target is shot away to such an extent that the Chief Umpire considers it unfit to lay on, he will order "*Stand Fast*," and issue fresh instructions. He may direct that the second target is to be treated as the leading one.

No interruption in a series will be made on account of a missfire.

Immediately on the conclusion of the practice, the Practice Report having been made out, all the officers concerned, and as many of the N.C.Os and men as the Lieut.-Colonel deems advisable will be assembled in the work from which practice has taken place. The Lieut.-Colonel will first criticise the conduct of the practice and draw attention to the points which he has made note of during the series.

The Chief Umpire will then take up any further points and will supplement the criticism of the Lieut.-Colonel as seems necessary.

CHAPTER IV.

CLASS FIRING—PRACTICE REPORTS.

SECTION 16.—PRACTICE REPORTS.

The Officer Commanding the Company is responsible to the Chief Umpire for the correct record of the practice on A.F. B 269, as compiled from the records kept during firing by the recorders in the battery and on range. On the conclusion of a series the B.C. or G.G.C. will hand in all records (A.F. B 82) to one of the Umpire Staff. The reports will be compiled by the Officer Commanding the Company (with the assistance of the Umpire Staff) immediately after the practice, to enable the Lieut.-Colonel and Chief Umpire to criticise and remark on it while fresh in the memory of all.

The instructions as to compiling Practice Reports given on page 4 of A.F. B 269 are to be amended so as to read:—
 "Form A, line 2, after 'guns' the calibre and mark should be entered."

"Form B, Column 10 should be filled in whenever possible when auto-sights are not used." "Form C, Columns 6, 7, 9, 10, 12, and 13 are to be filled in whenever possible."

The Chief Umpire will, on the conclusion of practice, see that the reports are properly made out, and then forward them with his report, and A.F. B 82-12, giving the list of Companies and their figures of effect, as determined by him, to the Coast Defence Commander. Except where the Lieut.-Colonel himself is the Chief Umpire, the latter will forward at the same time, for the information of the Coast Defence Commander, a separate confidential report on the capacity of the Lieut.-Colonel to criticise efficiently the conduct of the practice.

The Chief Umpire will, in his report, certify that the complete battery command was fully manned in accordance with the manning table. He will also state whether the battery was reported ready for action at the time

ordered. Should it have been found impossible to comply with any of these instructions, the reasons that prevented compliance should be stated.

Before Class Firing commences the Chief Umpire will be furnished with a nominal roll of the Company, made out in the form given below. On this roll, the employment of each Officer, N.C.O., and Gunner in the various series will be noted. The nominal roll, when completed, will be attached to the Chief Umpire's report.

The Practice Reports will be carefully checked and criticised in the Office of the Coast Defence Commander. One copy of the Report, together with the criticism and A.F. B 82-12 in duplicate, will be forwarded to the School of Gunnery, as laid down in Section 22, page 39. In the case of Companies at home, this will be done not later than November 1st.

The practice reports of the combined series, in addition to being entered in each Company's practice report, will also be entered in a separate book for the Fire Command. The figure of merit of the Fire Command will be worked out, and the practice will be criticised by the C.D.C. from the point of view of the defensive efficiency of the Fire Command as a whole.

The following should also be forwarded to the School of Gunnery with the copy of the Practice Report:—

The certificate of the Lieut.-Colonel Commanding, in accordance with Chapter I, Section 2.

The Chief Umpire's report, with nominal roll attached.

A list of the qualified layers of the Company, with the tabulated results of the last quarter's examinations and diagrams of the 5th test.

Copies of new diagrams or tables of permissible errors, or probable hits, or of old ones amended.

For the disposal of Practice Reports *see* Chapter VII, page 39.

Care should be taken that Practice Reports are properly made out before they are forwarded, as their return from the School of Gunnery for amendment, or for a fair copy to be made, may seriously delay the issue of badges to a company.

CHAPTER V.

CLASS FIRING (MISCELLANEOUS).

SECTION 17.—RANGING ALLOWANCES.

Ranging allowances are deducted by the Chief Umpire from the gross times of series fired from heavy and medium guns. The basis on which Companies are judged being the hits per gun per minute obtained, it is apparent that time taken in observing the fall of rounds and ordering and applying corrections, tends to reduce figures of effect. Ranging allowances enable the Chief Umpire to deduct from the total time of a series the necessary portion of the delay caused by the ranging actually done in the series.

Any delay caused by ranging beyond this is presumed to be due to faults of the Company, and is left to reduce the figure of effect.

In war, where expenditure of ammunition is usually of secondary importance, it may often be correct to open with a rapid rate of fire, but at peace practice, where it is desired to get the greatest amount of instruction out of a small number of rounds, it would be wasteful to do so.

For this reason officers are forbidden (except in the case of anti-torpedo boat guns) to resort to a rapid rate of fire before they have ranged their guns; the ranging allowance is provided to prevent officers from being penalised for complying with this order.

In working out ranging allowances for heavy and medium guns, other than High Angle Fire Guns, the Chief Umpire will assume that 8 seconds, added to the mean time of flight of the ranging rounds, is the least time that could have been taken for observing, and ordering and applying corrections for each of the opening rounds actually used for ranging. He will ascertain the effect on the total time of the series that would have been produced by a delay of this amount, or such less amount as he deems right, occurring after each of the ranging rounds, and will deduct the number of seconds thus arrived at as the ranging allowance for the series.

The number of rounds on account of which ranging allowance is given must not exceed four if the mean range of the ranging rounds is less than 6,000 yards, and six if it is greater, except that when more than two guns using auto-sights are engaged in a series, in which they have not

previously been ranged by other means, the number may be two per gun. No round will be considered in respect of ranging allowance after the order "Independent Fire" has been given.

If an interval between rounds is less than the admissible delay for ranging (8 seconds plus the mean time of flight of the ranging rounds), the actual interval only will be taken into consideration. If in the opinion of the Chief Umpire an interval was too short to have been used for ranging, no allowance will be made in respect of this interval.

If a single group is ranged by "Deliberate Fire by Groups," an interval of 3 seconds may be allowed between the rounds of guns to allow of identification. Guns ranged with auto-sights, when not previously ranged with other means of laying, will always employ this method of fire for ranging; a single round may, however, be fired first to test deflection.

If more than one group is ranged by deliberate fire by groups, each group will be treated for ranging allowances as if it were a single gun, and four group salvos may be observed and corrected on if the range is less than 6,000 yards, and six if it is greater.

If different natures of guns requiring separate ranging are used in a series, ranging allowances will be worked out separately for each group, and to the allowances for each group, if they are ranged simultaneously, 10 seconds may be added if there are two natures of guns in the series, and 15 seconds if three.

The reckoning of ranging allowances is mainly a matter of common sense, but a few examples are given for the assistance of Chief Umpires.

Example I.

Two 6-inch B.L. Mark VII guns, not using auto-sights, mean time of flight for ranging 12 seconds.

Deliberate Fire by single guns used, Independent Fire given after 3rd round was observed, or round 5 fired before an order could have been given after observing the fall of round 4.

$$12 \text{ seconds} + 8 \text{ seconds} = 20 \text{ seconds.}$$

With the ranging actually carried out guns could have been fired at:—

No. 1 gun.	No. 2 gun.
0 seconds.	20 seconds.
40 "	60 "
60 "	

Had there been no ranging, these times could have been according to Table 2, page 32.

No. 1 gun.	No. 2 gun.
0 seconds.	0 seconds.
10 "	10 "
20 "	

The delay due to ranging was 40 seconds at No. 1 gun, and 50 seconds at No. 2. The allowance admissible would be 45 seconds.

Example II.

Two 4.7-inch Q.F. guns, not using auto-sights, mean time of flight for ranging rounds 9 seconds.

Deliberate fire by groups, ranging ceases after observing first two rounds.

$$9 \text{ seconds} + 8 \text{ seconds} = 17 \text{ seconds.}$$

Therefore, allowing for 3 seconds interval, rounds might with the ranging carried out, have been fired at:—

No. 1 gun.	No. 2 gun.
0 seconds.	3 seconds.
20 "	20 "

With no ranging these times might have been:—

No. 1 gun.	No. 2 gun.
0 seconds.	0 seconds.
6 "	6 "

A ranging allowance of 14 seconds is admissible.

Example III.

Two 4.7-inch Q.F. guns using auto-sights, mean time of flight for ranging rounds 10 seconds.

Round 1 fired separately to test deflection, ranging ceases after round 4 is observed.

$$10 \text{ seconds} + 8 \text{ seconds} = 18 \text{ seconds.}$$

With the ranging carried out and allowing 3 seconds between rounds 2 and 3 and rounds 4 and 5, rounds might have been fired at:—

1st gun.	2nd gun.
0 seconds	18 seconds
21 "	39 "
42 "	57 "
57 "	

If there had been no ranging these rounds might have been :—

1st gun.	2nd gun.
0 seconds	0 seconds
6 "	6 "
12 "	12 "
18 "	

The delay is therefore 39 seconds at No. 1 gun and 45 seconds at No. 2 gun. The allowance admissible is 42 seconds.

Example IV.

In the preceding example, if the first two rounds had been fired with a 3 seconds interval only, and independent fire ordered after their fall had been observed, the admissible ranging allowance would have been $(21 - 6)$ or 15 seconds.

Example V.

If in Example III auto-sights had not been used, and 4 rounds deliberate fire by single guns had been observed before ordering independent fire, the ranging allowance admissible would have been $(72 - 12)$ or 60 seconds.

Example VI.

If the groups in Examples I and III were engaged in a combined series under one B.C., the Chief Umpire may, if he considers the Company entitled to the extra allowance, make the ranging allowances $(45 + 10)$ and $(42 + 10)$, or 55 and 52 seconds respectively.

High Angle Fire Guns.

For High Angle Fire Guns (similar calculations will be made. The time of flight will be that for the charge used, the added time will be 20 instead of 8 seconds, and the number of ranging rounds or salvoes, 6 instead of 4.

High Angle Fire Guns are generally fought by salvoes with 5 seconds interval between each round of a salvo. Time allowance may be made for the actual intervals between the rounds of salvoes, but the amount allowed for in respect of any one interval must not exceed 5 seconds.

If firing at a moving target by Case III, predicting, an allowance up to 30 seconds may be given for each round or salvo for which a prediction is made. The amount allowed should be that of the delay which the Chief Umpire considers was necessarily caused by the prediction. During ranging the allowance for predictions will be in addition to that given as ranging allowance.

SECTION 18.—RATES OF FIRE.

The following table shows the highest rates of aimed fire considered to be probable, but it does not follow that they should be worked up to at the expense of accuracy.

TABLE 2.

Nature of Gun.	Time for One Round.	Rate of fire in Rounds per gun per minute.
	Min. sec.	
5-in. B.L.	0 30	2·00
†6-in. B.L. barbette	0 35	1·72
6-in. B.L. H.P.	0 55	1·09
6-in. B.L. Mark VII by day	0 10	6·00
6-in. B.L. Mark VII by night	0 20	3·00
8-in. B.L. barbette	1 0	1·00
9·2-in. B.L. (Marks I to VI) bar- bette and H.P.	1 15	·8
9·2-in. B.L. Mark IX on { by day ..	0 30	2·00
Mark III mounting { by night ..	1 0	1·0
*9·2-in. B.L. Mark IX on { by day ..	0 40	1·50
Mark IV mounting { by night ..	1 20	0·75
*9·2-in. B.L. Mark X on { by day ..	0 25	2·40
Mark V mounting { by night ..	0 50	1·20
10-in. B.L. H.P. and barbette, Marks I and II	1 30	·67
10-in. B.L. barbette, Mark IV	0 45	1·33
3-pr. Q.F., cone mounting	0 3	20
6-pr. Q.F., with and without auto-sights by day	0 3	20
6-pr. Q.F., with and without auto-sights by night	0 4	15
12-pr. Q.F., auto-sights or other- wise by day	0 4	15
12-pr. Q.F., auto-sights or other- wise by night	0 6	10
4·7-in. Q.F. by day	0 6	10
4·7-in. Q.F. by night	0 10	6
6-in. Q.F. by day	0 10	6
6-in. Q.F. by night	0 20	3
R.M.L., H.A.F. guns	1 15	·8

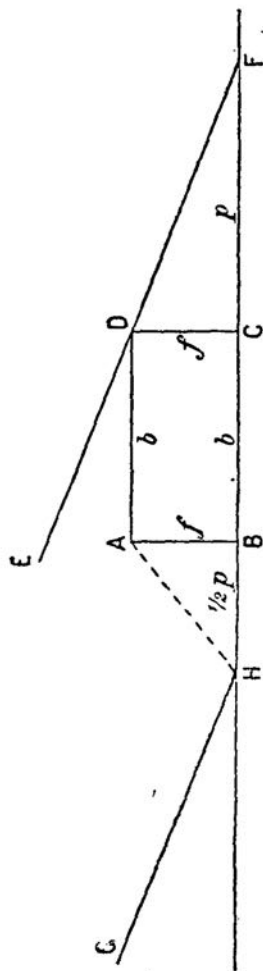
† When powder charges are used, the time for one round will be 45 seconds and rate per gun per minute 1·33.

* When hydraulic hoists cannot be used, and this is not the fault of the Company the time for one round will be 45 seconds and rate per gun per minute 1·33.

SECTION 19.

SCORING HITS AND CALCULATING HITS PROBABLE.

In the figure, B is supposed to be on the line of the towed targets, and A B C D is the imaginary target, of beam b yards, and of freeboard f yards.



E D F is the trajectory, on arrival, of the longest round that can score a direct hit, G H that of the shortest that can score a ricochet. E D F and G H are treated for simplicity as if they were straight lines, parallel to each other, and having an angle of arrival due to the range of the point B.

Denote C F, the permissible error (+) due to freeboard, by p . Let α = the angle of sight, and θ = the angle of descent for the point B. The angle of arrival = $(\alpha + \theta)$

and we have $p = \frac{f}{\tan(\alpha + \theta)}$ *

In calculating α , the height over mean sea level is to be taken.

H B, the permissible error (-), = $\frac{1}{2} p$ by convention.

B F, the total permissible error (+), = $b + p$.

H F, the total effective target on the water, = $b + 1\frac{1}{2} p$.

Values of $\frac{1}{2} p$ should be calculated for every 500^x, and plotted on squared paper. A curve drawn through the plotted points will give the value of $\frac{1}{2} p$ for any intermediate range. The value of $b + p$ for any range can be obtained from the curve by simple mental arithmetic, and the rounds of a series that are "in" for range can thus readily be determined. A specimen curve of the values of $\frac{1}{2} p$ is given on the accompanying diagram.

In Table 2, page 32, is given the maximum rate of fire possible for various guns, in rounds per gun per minute.

Owing to the imperfections of the gun, all these rounds are not necessarily hits, even supposing that the service of the gun is perfect. In all range tables there is given the length of the zone, measured along the line of sight, that is required at each range to receive 50 per cent. of the shots fired with the same elevation.

As the 50 per cent. length zone of the gun given in the range tables is measured along the line of sight it must be multiplied by $\frac{\sin \theta}{\sin(\alpha + \theta)}$ or by $\frac{\theta}{\alpha + \theta}$ (where α = the angle of sight, and θ = the angle of descent), to obtain the 50 per cent. length zone measured along the water. Let this be denoted by g in yards.

* To get p by slide rule, upset and invert the slide (i.e., use sine tangent scale upside down), move the slide till the end of the scale comes opposite f on one of the scales of the rule. Then bring cursor over $(\alpha + \theta)$ on the proper scale of the slide, and the value of p will be found under the cursor on the scale on which f was taken.

If $(\alpha + \theta)$ is less than $5^\circ 44'$ use the top scale of rule and sine scale of slide.

If $(\alpha + \theta)$ is more than $5^\circ 44'$ use the bottom scale of the rule and tan: scale of slide.

If the total effective target on the water, *i.e.*, ($b + 1\frac{1}{2} p.$) be four times g , or more, then every round will be a probable hit. If less, divide the depth by g , the quotient will be a probability factor. In the table of Probability Factors (G.A.T., Vol. I.), find the corresponding percentage of probable hits. This percentage is to be used in calculating the figure of effect as laid down in Section 11, page 20.

The percentage of hits probable should be calculated for every 500^x, that for the intermediate ranges being determined by means of a curve drawn on squared paper.

In calculating the percentage of hits probable, the mean range of the series, as defined in Section 10, page 18, will be taken. The height will be the height above mean sea level of the axis of the trunnions.

CHAPTER VI.

BATTLE PRACTICE.

SECTION 20.

The remainder of the Practice ammunition will be fired under the above sub-heading. It may be possible to combine Station Practice with it.

The object of Battle Practice, which is in many respects the most important form of practice, is to familiarise all ranks with the guns they may be called upon to man on mobilization, and to accustom them to fire under conditions more closely resembling those of actual service than is possible during Class Firing and other forms of practice.

With Heavy and Medium guns a considerable portion of the practice should be carried out simultaneously from all the works in a Fire Command. The Lieut.-Colonel, or other Officer detailed on mobilization, would act as Fire Commander. Sometimes several targets may be employed to practice distribution of fire. At other times a single target may be used to illustrate the difficulty of several batteries ranging on the same target. Or again, a single group may be employed against a target representing a ship approaching from an extreme range; the action need not be continuous, but the target should be ranged upon at several ranges widely separated in point of distance to illustrate the varying corrections that may have to be applied in such case.

Series may be fired at targets representing particular battleships, B.C.s adapting their ammunition according to the range at which they engage, and subsequently plotting out the hits obtained on a diagram of the ship and estimating the damage done. Wherever possible some series from light Q.F. medium guns and even 9 2" should be fired by night.

When it is impossible, during combined firing, for some groups in a Fire Command to practice with service or practice ammunition, it may be possible for them to do so with aiming rifles.

A considerable amount of the ammunition should be devoted to instruction in ranging under varying conditions. Useful instruction may be obtained by interrupting a series

as soon as fire is effective, and resuming it at a range differing sufficiently from the first to considerably alter the ranging conditions. Rapid work at the guns must be insisted on, but this can be tested by noting the time between a gun fired and being ready to fire again, and also the delay in firing after the order to fire has been given.

Ammunition supply by lifts or from the more distant depôts should be practised, and shells fixed in positions as closely resembling those used for the purpose in war as possible, and sent up to the guns. All guns should sometimes be worked short handed. In a word, all the conditions which are likely to exist in battle, but which are unsuitable for Class Firing, should be thought out and tested.

It has been found possible in some localities to carry out night practice from medium and heavy guns. Safety considerations often render this impossible, but where they can be complied with, and the guns are likely to be used at night, it is most important that night practice should be carried out from them.

Records should be kept as far as possible. Ammunition is so costly that no effort should be spared to gather information from its expenditure, both as regards guns, mountings and appliances, and as regards the mistakes liable to be made by personnel.

The conduct of practice including criticism would be carried out as laid down in Chapter III for Class Firing, but it may be possible to vary the opening of fire and other details so as to make practice more closely resemble an actual engagement. For the disposal of practice reports see Section 22, page 39.

The practice reports of a combined series, after compilation by the companies taking part in it, should be collated in one book, together with the tactical scheme, and diagrams showing hits, on the ships supposed to be attacking in this scheme. The whole practice should be reviewed and commented on from the point of view of the defensive efficiency of the fortress or section engaged.

SECTION 21.—LIGHT Q.F. GUNS.

With light Q.F. guns, practice should be by night whenever possible. The conduct of practice would be similar to that laid down for Class Firing, but it will be possible with these guns also to make the conditions of practice more like those of war.

Guns in outer defences should generally receive no

warning of the approach of targets. For guns in inner defences alarm circuits, and search and sentry beams should sometimes be employed; sometimes the search lights should be dispensed with; and sometimes the sentry beams and alarm circuits too, the target entering the illuminated area without avoidable warning being given.

Orders to the Range Officer as to hour of attack, course to be set, &c., should be kept secret. Signals to the launch towing the targets should, if possible, be avoided entirely; any sent should be kept secret from the groups firing, and the transmission of the messages should, if possible, not disclose the position of the launch.

The launch towing the targets will not take up position at her starting point till after dark; if possible she will show no lights, and will not by her movements disclose the direction of attack.

It may sometimes be possible to arrange for the launch, after passing the inner edge of the illuminated area, to stop for some time with the tow line paid out and the targets still beyond the far side of the illuminated area. The run of the targets through this area could then be made without the warning usually given by the approach of the launch. The practicability of this manoeuvre depends on wind, tide, nature of bottom of sea, length of tow line, &c. The illuminated area may sometimes be narrowed if too broad for the length of tow line.

Whenever possible, having due regard to safety, it is desirable that night practice should be carried out at more than one target, so as to afford instruction in distribution of fire.

Regulations as to safety precautions, both for day and night practice, will be found in Chapter X., pages 57 and 58.

CHAPTER VII.

MISCELLANEOUS.

SECTION 22.—PRACTICE REPORTS.

Practice reports will be rendered and disposed of as under :—

TABLE 3.

Nature of Practice.	Number of Copies.	By whom prepared.	Disposal.
(1) Elementary—Instructional	1	O.C. Company ...	To O.C.R.A. to be returned by him with his remarks to O.C. Company.
(2) Service—Instructional or Class Firing	2	O.C. Company, counter-signed by Empire	Forwarded through Coast Defence Commander to the Commandant S.G. (1 copy C.R.A.)
(2b) General report on combined series	1	F.C. or O.C. the practice	Forwarded through Coast Defence Commander direct to Commandant S.G.
(3) Battle	1	O.C. Company, counter-signed by Lieut.-Col. commanding R.G.A. Division.	Forwarded through Coast Defence Commander direct to Commandant S.G.
(3b) General report on combined series	1	C.D.C.	Forwarded by C.D.C. to Commandant S.G.
(4) Militia and Volunteer Artillery not included in Station Practice	1	Officer who superintends or carries out the practice	Forwarded through O.C.M. and V.A., who sends it on with his remarks to the Coast Defence Commander. Finally returned through O.C.M. and V.A. to the Corps with remarks of the Coast Defence Commander.

NOTE.—When companies practice at camps outside the commands in which they are serving, the practice reports will be forwarded through the Coast Defence Commander in immediate command to the Coast Defence Commander in whose command the companies are permanently stationed, and will then be dealt with and transmitted as above.

The time of rendering practice reports will be as follows :—

Battle.—On completion of the whole of the practice for the year. In the case of home stations, reports of all Battle Practice between the 1st April and 15th October should be sent in not later than 1st November, so that the practice can be reviewed in the annual report. Reports

of any practice carried out between 16th October and 31st March should be sent in as soon after the 1st April as possible.

Reports made out by stations in duplicate of missfires and of failures and defects in ammunition and material will accompany these practice reports. They should show all the failures and missfires at all practice during the year, and the total number of rounds fired, so that a percentage of missfires and failures to rounds fired may be arrived at. The missfires should be reported on a separate form.

Service Instructional, and Class Firing.—On completion of the Service Class Firing. In the case of Companies at home stations, not later than 1st November.

A.F.B 82, 12, which will be attached to the Practice Report of each Company, will show the Coast Defence Commander what he wants to know about the shooting of his Companies, viz.:—

- (a) How many rounds were fired.
- (b) How many hits were obtained.
- (c) How long it took to obtain those hits.

By means of this form, combined with the information given in the practice reports, the value of the practice carried out by each Company, causes of bad shooting, etc., can be ascertained and points requiring special attention arrived at.

The results of at least three years' practice will also be tabulated and forwarded to the Coast Defence Commander so as to show:—

- (a) How companies compare among themselves.
- (b) How their practice compares with that of former years.
- (c) How the whole practice of the Command compares with that of former years.

SECTION 23.—GUNNERY BADGES.

Badges as under are allowed for competition among the N.C.Os (under the rank of serjeant) and men of each Company.

Rank and file N.C.Os and men of District Staffs are not eligible to compete.

One badge of 1st, 2nd, and 3rd Class for each Company.

- 1st Class Badge .. a "G" in gold with crown.
- 2nd " " .. a "G" in gold with star.
- 3rd " " .. a "G" in gold.

Gunnery badges gained by competition among the serjeants of the companies will consist of 1st or 2nd Class badges as described above, and be at the rate of two per Company.

Gunnery badges will be competed for in separate classes by such N.C.Os and men, selected as smart and good artillerymen by the Company Commander, as may desire to compete for this distinction.

They will be tested by a written examination on papers prepared and forwarded by the district Instructor in Gunnery, or other officer appointed by the Coast Defence Commander (all examinations to be held in each District on a given day, published in Royal Artillery District Orders), as well as practically at drill, and in their knowledge of the artillery material at the station.

The Lieut.-Colonel or other Officer Commanding will appoint a Board of Officers to carry out this examination.

He will award the badges to those best qualified, to the number allowed per Company, as recommended by the Board, and the examination papers and results of the same will be retained in his office until after the date of the next inspection by his Coast Defence Commander. To qualify for a badge a competitor must obtain 0.5 in the examination.

In the event of a tie, steps must be taken for a further test.

The Lieut.-Colonel will forward to the Coast Defence Commander a list of the individual winners.

The Coast Defence Commander will, after examination, forward the list of winners to the General Officer Commanding, who will authorise the publication of the names in the Coast Defence Commander's Orders or the Royal Artillery District Orders.

The badges will be at once taken into wear.

The badges will be worn until the publication of the lists of next year's winners.

SECTION 24.

(Paragraph 295, Volunteer Regulations, 1901.)

COMPETITION FOR BADGES—ROYAL GARRISON ARTILLERY— (VOLUNTEERS), 1907-8.

Conditions for Competition.

1. Each Company will fire a series from a group of at least 2 guns, limited by time in accordance with the amount of ammunition available.

2. The conditions under which the series is fired will be strictly in accordance with "Instructions for Practice Seawards," 1907-8, and the figure of merit will be worked out as therein directed.

3. Companies will be classed according to the figure of merit obtained.

4. The B.C. must be an Officer of the Company, and the G.G.C. either an Officer or the Senior N.C.O. present at the practice.

5. There will be no preliminary practice on the day of the Competition series.

6. Umpires and Range Officer will be detailed by the O.C.R.A. in the sub-district.

7. The results of the competitive series will be rendered in a separate report as soon after the practice as possible, but the series will also be included in the Annual Practice Report.

CHAPTER VIII.

GUN LAYERS.

SECTION 25.—REGULATIONS.

At any practice, except elementary practice, guns must be layed by qualified layers.

Gun layers' badges (a letter "L" worked in gold) are authorised to be drawn by a company up to 8 per cent. of its strength. They will be held by the qualified layers who are placed highest on the list as the result of the quarterly examinations.

At least 10 per cent. of the strength of a company are to be qualified layers. Serjeants and corporals who may be qualified layers will not count towards this percentage.

To be qualified layers N.C.Os. and gunners must be efficient dial readers and Range Indicator numbers, and must qualify once a year in all six of the tests which follow.

The first two tests must be qualified in before passing on to the third, fourth, fifth, and sixth. All layers will be exercised in the tests at least once a week under an Officer, and they will be examined in the last four once a month. The marks obtained in the three monthly examinations of each quarter will be added together and will be used for placing the qualified layers of a company in order of merit. The results of weekly, monthly, and annual tests will be entered on tables and diagrams and kept in the company records.

Lieut.-Colonels Commanding will decide all questions that may arise affecting the order of merit of layers. In the case of unavoidable absence from monthly examinations the position of the layer may be decided by the weekly records of tests. A layer who has undergone no examination in a quarter should generally be placed at the bottom of the list.

Any layer disqualified in any test during an annual or monthly examination will be removed from the list of qualified layers, and cannot be replaced on the list till the end of the ensuing quarter. Layers found inefficient at practice will be dealt with similarly by the Lieut.-Colonel Commanding, who may also refuse to sanction their subsequent restoration to the list of qualified layers.

SECTION 26.—TESTS.

1st Test.—General knowledge and reliability.

- (a) Watkin clinometer—using, setting, reading.
- (b) Tangent or rocking bar sights—rapid and accurate setting of ten elevations and deflections.
- (c) Auto-sights—names and uses of various parts, testing the adjustment.
- (d) Traversing arcs—use in laying.

Four marks may be gained in each sub-head, a total of 12 to qualify.

2nd Test.—Means of firing.

- (a) R.M.L. guns—identifying tubes and attaching lanyards (for companies allotted to these guns on mobilization only.)
- (b) 6-pr. and 3-pr. Q.F.—dismounting and assembly of breech mechanism, replacing damaged parts (for companies allotted to these guns on mobilization only.)
- (c) Other Q.F. guns—removing, stripping, adjusting, and replacing striker, gauging its protrusion, making ready for electric and percussion firing.
- (d) Firing circuits—connecting up and testing (to include battery and key, test and firing).

Full marks—16, 12 marks to qualify.

3rd Test.—Tangent sights.

The layer, using open sights, will lay a heavy gun three times, and also a medium gun three times. Two or three well defined objects more than 10 degrees apart will be selected at medium ranges, and ranges will be ordered requiring a movement of elevation of more than 1 degree in changing from target to target.

The gun will first be carefully laid on each target by the Officer, with the range chosen, and the Q.E. of the gun noted. Each competitor will look over the sights and identify the targets. The Q.Es will be taken as standard elevations for the test. The gun will be moved from one target to another, at each lay. The Officer will order “ yards R. (or L.) Lay.”

When the word “Lay” has been given, the competitor will stand to his sight, adjust it for range and deflection, lay his gun, call “Fired” and step clear.

The elevation of the gun will be taken by clinometer.

The error in line will be checked by the Officer.

No marks will be given for any lay in which the Q.E. is more than 3 minutes different from standard lay, or which, with the sights set as ordered, is more than 5 minutes wrong in direction.

Subject to the above conditions, five marks will be awarded for each good lay which is concluded in 30 seconds or less. Should 30 seconds be exceeded, 1 mark will be deducted from the total gained for each 5 seconds or portion of 5 seconds in excess.

20 marks will be required to qualify out of a total of 30.

4th Test.—Straight edged sights, or telescopic sight used for direction only.

The two sets of sights will be similarly set. The layer, using one set, will keep his gun a suitable distance ahead of a moving target.

On the command "A 1, fire," he will complete his laying and call out "Fired." This will be done four times. The Officer by means of the second set of sights will check the distance that the gun is kept ahead, and the direction at the moment when "Fired" is called. The time from "A 1, Fire" to "Fired" will also be taken.

For qualification with straight edged sights, the 4 lays must take less than 12 seconds, and each lay must be measured or judged by the Officer to be less than 5 minutes away from the line chosen. For each very good lay 3 marks will be given, for each good lay 2 marks, and for all others within 5 minutes, 1 mark, but 1 mark will be deducted when any lay takes more than 3 seconds.

With telescopic sights the Officer will give up to three marks for each lay, according to his discretion, and eight marks will be required to qualify.

5th Test.—Auto-sights.

(a) *Target.*—A well-defined stationary target in the water will be chosen, if none is available an anchored target will be used. The range must be long enough for the ratio of movement of gun to sight to be more than 3 to 1, but reduced charge or aiming rifle cams may be used.

(b) *Laying.*—Telescopes should be used.

Each competitor will lay 5 times on the water line of the target. Before each lay the gun will be traversed so that the target is clear of the field of the telescope, and the gun will be elevated above the target before 3 lays, and depressed before the other 2. Two or more turns of the

handle being given in each case in addition to any turns required to absorb backlash in elevating gear.

The Officer will order "*Lay.*" The competitor will then lay, call "*Fired*" and step clear. The interval between "*Lay*" and "*Fired*" will be measured each time. During two of these intervals deflection will be changed by the layer according to directions given by the Officer before the order "*Lay.*"

(c) *Checking the Laying.*—The Officer will note if each lay is within $2\frac{1}{2}$ minutes for line.

A clinometer will be kept on the gun, and the Q.E., after each lay, will be carefully read and noted, but the gun layer should not be told the result of any lay until he has finished. The sum of these lays, divided by the number of them, is the mean lay. The difference between each lay and the mean will then be taken, and the sum of these differences, irrespective of sign, divided by the number of lays, is the *layer's mean error along the gun*.

With every auto-sight a "Table of Angles" is issued, showing corresponding angles of Q.E. and sight. If two angles of Q.E. are chosen, one on each side of the Q.Es of the gun during the test, and the difference between them taken, and also the difference between the corresponding angles of sight, then the ratio which the difference in Q.E. bears to the difference in angle of sight may be taken as the ratio of movement at the range used.

If the layer's mean error be divided by the figure expressing this ratio, the result is the *layer's mean error along the sight*.

(d) *Qualifying.*—To qualify, every lay must be within $2\frac{1}{2}$ minutes of the proper line, the layer's mean error along the sight must be less than .4 minute, and the total of the times taken for 5 lays must not exceed 1 minute, for 6" guns and upward, nor 45 seconds for guns of less calibre.

The Lieut.-Colonel Commanding may, in addition, on application from the O.C. the Company, disqualify any competitor who, though otherwise satisfactory, lays very much above or below the general level of the other layers.

(e) *Marks.*—Marks will be given for accuracy and rapidity. The layer's mean error along the sight will be subtracted from .4, and the result multiplied by 60, will be the marks for accuracy.

The number of seconds taken will be deducted from the number allowed, and half of the remainder will be the marks for rapidity.

The sum of the marks for accuracy and rapidity will be given as marks for the test.

(f) *Record*.—The lays should be plotted on a diagram; each layer's form is then seen at a glance.

The mean of all the lays should be calculated and plotted. When tide changes much during laying a selected layer whose mean lay is known to be nearly that of the Company should lay before and after the rest of the layers. The line joining the mean of his two sets of lays should be taken as representing the mean lay of all the layers. Layers should lay in rotation according to their places in the Company records, so that their laying week by week can be readily compared.

6th Test—Case III. A.—For Dials in Recesses.

A selected N.C.O. will call out the trainings and ranges given by a P.F. The Officer will check the elevation, put on by the layer acting as elevating number, by comparing the range on dials and on elevation indicators; he will order corrections to be applied on the gun (not on the dials). The Officer will check the laying for line by looking over the sights at the target, and by comparing the training arc and training dial; he will order deflection, drift deflection, and convergence to be applied. The Officer will order "A/1 Fire" two or three times while the layer is laying for elevation and also while he is laying for line, and will note the accuracy and rapidity of the layer, and that final depression is given except where the contrary course is laid down.

B.—When Dials are on Mountings.

(a) The Officer will check the elevation put on by the layer acting as elevating number, by comparing the range on P.F. Dial and Elevation Indicator. He will order corrections to be applied on the moveable face dial, and will be careful to see that the last motion is one of elevation or depression according to the nature of the mounting.

(b) The Officer will check the laying for line, by comparing the reading of training arc, with P.F. Training Dial. He will order deflection and drift deflection. He will see that the layer applies the convergence corrections correctly.

(a and b) The Officer will order "A/1 Fire" two or three times, while the layer is laying for elevation, and also while he is laying for line. The gun should be thrown off for line and range after each round.

The Officer will allot, at his discretion, four marks for work with the Elevation Indicator, four marks for following, and four marks for applying corrections. A total of eight marks will be required to qualify.

CHAPTER IX.

SECTION 27.—RANGE PARTY.

These instructions are drawn up for Range Parties on launches towing targets, but they are also applicable, except in details which must be suitably modified, when practice is at anchored or drifting targets.

Regulations for safety are given in Chapter X. The Range Officer must make himself acquainted with all those that affect the Range Party.

The Range Party will consist of a Range Officer, with a recorder and one or more assistants and two efficient signallers. It must be strong enough to do any work required in handling targets.

The Range Officer should not as a rule belong to the Company firing, as it is better for the officers of this Company to be at the guns. At Class Firing he is an Umpire and neither he, the recorder, nor his assistants, must belong to the Company firing. At Aiming Rifle Practice the Range Officer may be replaced by a N.C.O.

Before proceeding to sea the Range Officer must satisfy himself that the targets are the correct distance apart and that his equipment of stores is complete. They include:—

Spare targets.

Means of measuring distance between targets.

Spare wire for joining targets.

Stores for commercial code, morse, and semaphore systems of signalling, and for night signalling when required.

Code of Signals.

Field glasses and telescopes.

Range rake.

Stop watch.

Range report form.

Chart of practice area.

Chart of courses, &c.

Local standing orders for Range Party.

Instructions for the day's practice, courses to be set;
number of rounds, hour for starting, &c.

"Instructions for Practice Seawards."

Rations, if required.

The Range Officer should be given clear written instructions as to the courses on which targets are to run, as to the time at which he should be ready to start on course, and as to the position at which he should await the order to do so. These instructions should give such detail as the ranges required for the practice, the direction to be steered, the points where targets should be unwound and wound in, and the speed of winding; where firing will begin and end, the number of rounds in each series, and the guns which are to fire them; where the launch will be required to turn, and the procedure for the next course to be set.

Charts, with a few numbered courses for targets marked on them, and provided with references to leading marks and cross bearings, will be found of great assistance in working range launches. The courses on the charts need not be numerous, as slight modifications of them to suit requirements can easily be arranged for.

Clearness in preliminary instructions will prevent many hitches and save much time; it may allow of practice proceeding smoothly at ranges at which it is impossible to read signals from the battery.

The Range Officer must endeavour to fully understand his written and signalled orders, and to carry them out with promptness. He will cause all shore signals to be acknowledged with the least possible delay. Should it be impossible to read these signals, and should practice cease for no apparent reason, though the pre-arranged course is being given, the range vessel will be brought in to a close enough range for signals to be clearly read.

A modified commercial code of signals for communication between launch and battery has been approved for use at practice.

The Range Officer will, in accordance with his instructions, and in concert with the master of the vessel, regulate her course and speed, and also the winding in and out of the high speed targets.

SECTION 28.—OBSERVING.

Before firing begins the Range Officer will have his recorder and the assistants he requires with him, but will

order the rest of the range party to some part of the vessel where they will not disturb him. During firing no unnecessary noise or talking is to be allowed, and the Range Officer will personally judge the fall of the rounds to the greatest degree of accuracy attainable, with the aid of the divisions on one of the range rakes described at the end of this chapter. He will make use of his assistants in the manner described in the same place.

When possible all rounds should be recorded. If a round falls outside the rake its distance from the target should be estimated. If more than one group or work is firing, endeavour should be made to note against each round the group or work from which it is fired; extra assistants may be needed for this purpose.

The Range Officer will call out his estimate on the fall of each round, and the recorder will enter it in the Range Report. Every time a pause takes place in the firing a mark should be made in the Report to assist in identifying rounds; further assistance may be given in identifying rounds by employing spare members of the range party to keep independent records of the fall of rounds as judged by them. A record of times of fall of each shot may be found of assistance in identifying rounds.

When fire is very rapid the method laid down in Chapter II, page 17, will be adopted.

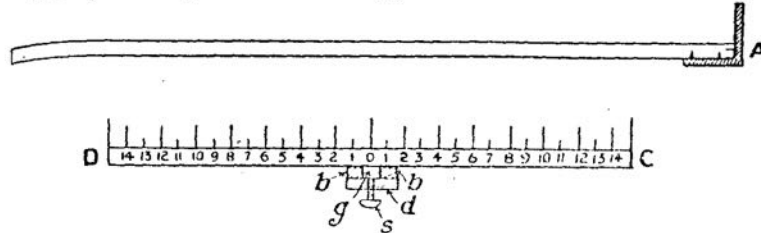
The Range Officer will ascertain the speed of the launch and targets during each run, and will enter them on the Range Report, at the same time noting the estimated effect that the tide had on speed.

On the conclusion of practice the Range Officer will take possession of the Range Report. He will ink in the records and sign the report. He will report as early as possible—by signal if it can be done—the results of practice to the Officer compiling the Practice Report, and will hand in his Range Report to the chief umpire. Subsequently he will sign the column of results as judged by Range Officer in the Practice Reports (Army Form B 269), and will sign a certificate to the effect that in judging distances from the target, he made use of one of the range rakes ordered to be used for the purpose. This certificate will accompany the Practice Reports.

The Range Officer will also, when required, make reports as to exposure of the personnel, guns, &c., of the works practising, effect of the defence lights and other matters.

SECTION 29.—RAKE FOR RANGE OFFICER.

The simplest form of rake is as shown below. Accuracy is improved by the automatic appliances described later.



A B is the handle, a rectangular rod of oak, 4 feet 3 inches long, $\frac{1}{8}$ inch wide, and $\frac{5}{16}$ inch deep. At one end, A, it is fitted with a window sight made from a strip of brass, $\frac{1}{8}$ inch wide, and $\frac{1}{16}$ inch thick. This is bent at right angles, and cut so that each arm is about 3 inches long. The window is cut out along the central line of one arm 1.5 inches to 2 inches long and about $\frac{1}{8}$ inch wide. The window is fitted to the rod as shown in the sketch, being held by three short screws below and two at the end.

C D is the cross bar, of oak, 3 feet long, $\frac{1}{8}$ inch wide, and $\frac{5}{8}$ inch deep. Two blocks, *b, b*, $2'' \times 1'' \times \frac{5}{8}''$, are placed transversely under the bottom, having their inner edges $\frac{5}{16}$ inch from the centre of the cross bar. Below these a third block, *d*, $3'' \times 2'' \times \frac{5}{8}''$, is placed, having a small wood clamping screw, *s*, through the middle of it. The gap, *g*, between the transverse blocks serves as a guide in which the handle can run.

The upper surface of the cross bar is marked off into divisions 1.2 inches long. Metal pins 2 inches long are driven at each end and at the centre of the cross bar, shorter pins at each of the even numbered divisions, and still shorter at the odd divisions.

Numbers are painted below the pegs on the cross bar, facing the sight when the bar is on the handle.

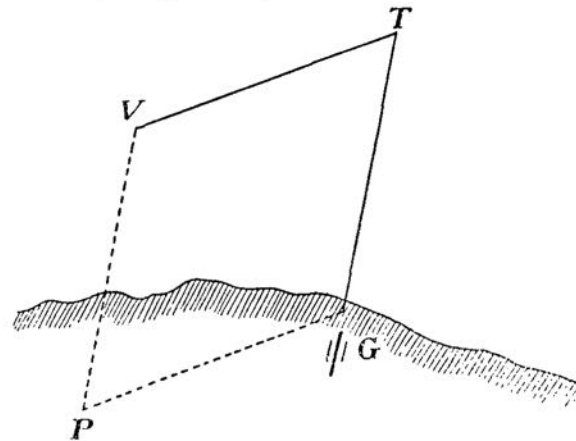
Each division of the cross bar represents 10 yards.

The upper surface of the handle is graduated to lengths, representing tow ropes of 400, 350, 300, and 250 yards, at points 4 ft., 3 ft. 6 in., 3 ft., and 2 ft. 6 in. from the cross bar.

In order that the cross bar may be adjusted for the obliquity of the line of fire to the course of the target, another block should be placed on the top of those shown in the figure, forming a socket through which the handle

can run. This block should have a pivot driven into the centre of its upper surface, and the cross bar should have a hole bored through just large enough to go over the pivot and turn with a little friction. The pivot will then appear as the central peg, and the cross bar will be free to move in a horizontal plane independently of the handle.

While the Range Officer keeps the handle of the rake directed on the target, an assistant should keep the cross bar as nearly as possible parallel to the line of fire.



In the figure G T is the line of fire, V T the tow line. The cross bar at V should be directed along V P, parallel to G T.

Many stations now have definite charted courses; a preliminary study of the chart should give an idea of the obliquity of the cross bar required at various portions of the course.

With winding-in gear the handle of the rake should be long enough to give graduations to 800 yards.

The Range Officer keeps his eye to the sight and the rake aligned on the target. He calls out the fall of each shot according to the divisions of the rake. He will verify the setting of the cross bar at the commencement and end of each run.

The assistant attends to the cross bar. When practice is carried out at a target with constant tow line, he sets the bar to the length ordered by the Range Officer, and when the target starts on its course, keeps the cross bar properly inclined to compensate for obliquity.

With winding-in gear the Range Officer will order the engineer to call out each 50 or 100 yards of tow line as it

is wound in, and if necessary, will detail another man to pass on the calls to his assistant.

The long handle will be used with the rake, and this will be set for half the tow line if it exceeds 800 yards, or for the length of the line if less.

The Assistant moves the cross bar up the handle 50 or 100 yards as each 50 or 100 is called, remembering that if the line is over 800 yards the cross bar must only be moved half the distance called. When the cross bar is brought up to the 400 yard mark, the Assistant informs the Recorder and quickly moves it out to 800 yards and then brings it in as the next 50 or 100 yards is called.

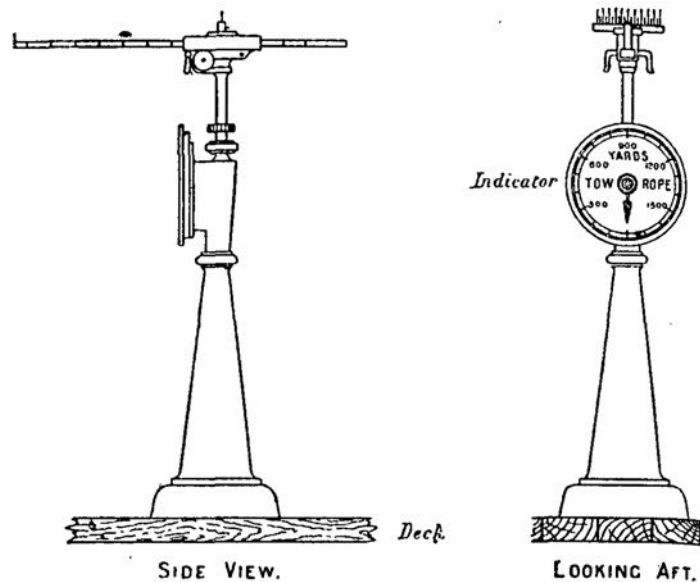
The Recorder marks the first round observed after the cross bar has been shifted back to 800, so that the Range Officer may know when the scale changed.

The Assistant, or a second Assistant, will also keep the cross bar properly inclined for the obliquity of line of fire to track of targets.

SECTION 30.—BRIDGE INDICATOR AND OTHER AUTOMATIC APPLIANCES.

Indicator.—Each vessel fitted with the special winding-in gear will in future have on the bridge platform, or other suitable position, a large graduated dial with pointer, the latter being worked mechanically from the winding engine, so as to indicate correctly, and in unison with a similar dial in the engine room, the varying lengths of tow rope paid out.

Automatic Rake.—To further facilitate the work of the Range Officer when winding-in gear is used, the "Travis" Automatic Rake will be supplied for attachment to the indicator referred to above.

"Travis" Automatic Rake.

This rake, by means of gearing, receives a sliding motion proportional to the travel of the target, and the adjustment of the length, which in the hand rake is carried out at intervals by the Assistant, becomes automatic.

To fix the Automatic Rake.—Remove the screwed cap from top of Indicator, and firmly screw on the rake in its place, observing that the socket in stem of rake takes the square end of spindle of Indicator, also that the stop-piece in swivel-nut enters the slot provided for it in the top of Indicator.

Slide the brass cross bar through its holder, set it central, and square, with the gear case, and fix it in this position by the pinching screws.

Lift the hanging handles and enter the ebony sliding bar, rack downwards, at the arrow-head end of the gear case.

Hinge up the sight and slide the bar in until the index to the side scales tallies with the pointer of Indicator dial, in recording the length of tow rope paid out.

Then lower the handles steadily to bring the rack into gear, and the Automatic Rake is ready for use.

To use the Automatic Rake.—The particulars already given regarding the method of using and reading the cross bar of the wooden rake apply generally to both patterns.

The sliding bar can be swivelled within the necessary limits, and a gripping nut on stem holds it, when required, in any position.

It has an elevating movement for sighting purposes, which can be clamped where required.

The sliding bar acts automatically for distances of target varying from 150 yards to 1,500 yards. Outside these limits it is designed to come out of gear, and when required again, the bar should be put into gear in its appropriate position by the Range Officer.

The Range Officer must be careful to keep his eye close up to the window of the rear sight of the sliding bar when observing.

The automatic rake is easily removed and replaced, and should not be left in gear unless the Range Officer is in attendance.

CHAPTER X.

SAFETY PRECAUTIONS FOR PRACTICE.

SECTION 31.—RESPONSIBILITY.

At all stations which are also naval stations, due notice of proposed dates and times of practice is to be sent to the naval authorities for their information. Before carrying out night practice, notice is also to be given to the local shipping authorities.

All general precautions to ensure safety during practice are to be ordered by the Coast Defence Commander, or, abroad, by the General Officer Commanding, and carried out under the superintendence of officers in charge of sub-districts. The officers on the spot, *i.e.*, officer superintending the practice, Fire Commander, Battery Commanders, and Gun Group Commanders, are, however, in the first place responsible, and cannot be absolved, by dependence on any general orders, for neglect to keep the closest watch on the safety of the practice.

It is the duty of the officer superintending the practice to satisfy himself that all precautions for safety have been taken, such as previous warning to neighbouring inhabitants that the practice is going to take place, the posting of necessary sentries, &c., and that the orders with reference to red flags are strictly complied with.

The whole of the responsibility for the safety of the range rests with the officer superintending the practice, and no practice will take place by day unless the sea area covered by the last ricochet of the projectile is well within his observation.

Should his other duties in connection with the practice make it necessary, he may detail another officer to assist him, but this will not absolve him from any responsibility.

The G.G.C. is responsible that gun captains are acquainted with the proper target and that it is pointed out to the gun layers and their reliefs, and also for

ensuring that they understand their individual responsibility. Special care must be taken that the range launch is not laid on. These precautions are specially necessary by night.

When firing at a towed target, gun captains will satisfy themselves that the launch has passed the line of fire before they give the order to fire. This is particularly necessary when laying by Case III. When the nature of the mounting makes it impossible for the gun captain to carry out his duties and also watch the line of fire, some responsible person, who often can be one of the umpire's staff, should be detailed at each gun with power to stop the fire if it should appear dangerous.

When "*Stand Fast*" is sounded, loaded guns will immediately be made safe by order of the G.G.Cs., all hands will then remain steady; but if a bare cartridge is exposed it must be replaced in the cylinder, or placed in the chamber of the gun if the projectile is home. On the command "*Cease Firing*," the order will be instantly repeated by the officers responsible for the service of the guns and the guns will be made safe by order of the G.G.Cs.

During a pause for a missfire the gun layer will keep the gun laid in a safe direction.

SECTION 32.—RED FLAGS AND RANGE OFFICER.

At all practice by day a red flag will be provided at the battery and with the range party. The range flag will be hoisted as soon as the target is on course. The battery flag will never be hoisted unless the range flag is up (except when firing blank), and the range is clear. No gun is to be fired, even with blank ammunition, unless the red flag is hoisted at the battery.

If the range flag is lowered for any reason whatever, the Officer superintending the practice will at once give the order "*Stand Fast*." The battery flag will be lowered when the guns have been made safe.

It is the duty of the Range Officer to lower his flag if he sees that the ricochets are falling dangerously near to any vessel which, on account of its small size or for any other reason, may have been overlooked by the responsible officer on shore.

The battery and range flags will never be raised or lowered except by the direct order of the officer superintending the practice and the Range Officer respectively.

The hoisting of the red flag on the range launch is a

signal that the launch is under way with the target ready to be fired at.

At the termination of the practice the battery flag will be left at half-mast.

When it can be arranged for, a red flag should be hoisted from an hour before practice until its conclusion, on some hill or conspicuous point, which must be distinct from any work from which practice may be carried out.

When practising at a towed target, the Range Officer will be responsible that the length of the tow rope is in accordance with instructions, and that it is never allowed to become so slack as to dangerously diminish the distance between tug and target. The length of the tow rope will never be less than 12 per cent. of the range, with a minimum of 300 yards.

The course over which the target is to be towed should be determined by the aid of a chart before the practice commences. It should be so arranged as to give the maximum variations of range during the series, consistent with safety to the tug. The Range Officer will be provided with a diagram of the proposed course, which should show clearly its extreme lateral limits.

For an increasing range the course of the target should not make an angle of more than 135° , or less than 45° , with the line of fire.

SECTION 33.—NIGHT PRACTICE.

For practice carried out by night special regulations for safety must be drawn up to suit local conditions. The following are given as a guide for framing such regulations:

Safety precautions depend on no firing taking place unless the area of water in which ricochets may fall is signalled clear of shipping. Picquet or other boats must be detailed for this purpose; the safety triangle being of no use at night except as regards the relative positions of the launch and the target.

The number of boats, which may be torpedo boats, picquet boats, or other vessels hired for the purpose, must depend on the perimeter to be guarded. They should be close enough to each other to enable all boats entering or leaving the guarded area to be detected. They should be lettered from a flank, and stationed at least 6,600 yards from the battery. This limit is for 12 prs., for limits for other guns see table. All boats should be in position in sufficient time to be able to see, before it gets too dark, what boats are within the area to be guarded.

On each picquet boat should be an Officer, or N.C.O. not below the rank of serjeant, and two signallers, all of whom should be good sailors if there is likely to be rough weather. Each boat should have coloured lights and rockets.

As soon as it is dark, each boat should get in communication with the boat on either side of it, and, if possible, with the battery. The battery will be provided with rockets.

The systems of signals and communications should be as follows :—

- (1) Shortly before firing commences, a rocket will be fired from the battery, which is to be answered, if the range is clear, by a flare from each boat, or, if the range is not clear, by rockets.
- (2) If a vessel passes inside the guarded area, the nearest picquet boat will fire a rocket, and as soon as a boat passes outside the danger limit, the nearest picquet boat will burn a flare, but no flares are to be burnt or rockets sent up before the first rocket from the battery.
All rockets fired from the battery will be answered by all picquet boats, either by flares or rockets, according as the range is clear or foul. A rocket from the battery is always interrogatory.
- (3) Boats wishing to communicate with the battery will call up their own letter, if with another boat, with the letter of that boat. The battery, when wishing to communicate with a boat, will call up with the letter of that boat.
- (4) The signal that practice is over will be the elevating and traversing of the electric lights.

SECTION 34.—SAFETY TRIANGLE.

To aid in judging the safety of the range, a safety triangle may be used. It consists of a triangular board, of any convenient size, the apex angle being 30° , with a handle placed under the centre of gravity and so shaped that, if required, it will drop into the top plate of a tripod of a D.R.F. instrument, if one is locally available.

A pin is fixed vertically at the apex end of the triangle, and another at the centre of the base; these give the centre line, which must be laid on the target.

Lines are drawn on either side of the centre line making angles of 5° , $7\frac{1}{2}^\circ$, and 10° respectively with it at the apex, and their intersections with the base are marked by pins.

To assist the eye to catch the proper pin for the desired safety angle, the triangle may be coloured red for the 5° danger angle, yellow from 5° to $7\frac{1}{2}^\circ$, and green from $7\frac{1}{2}^\circ$ to 10° .

SECTION 35.—SAFETY OF LAUNCH.

I. With shot and plugged shell and aiming rifles.

The launch should never be nearer to the line of fire than 5° , measured by the safety triangle. With shot and plugged shell, when the launch is nearer to the battery than 1,000 yards, a danger angle of 15° should be allowed for fear of a projectile breaking up in the bore.

II. With live shell.

The course of the target should be arranged, and length of tow line regulated, so that the launch is distant from the line of fire as follows:—

With 3, 6 and 12-pr. Q.F.	.. ..	500 yards.
„ 4-in. Q.F. and Medium Common	.. ..	700 „
„ Heavy Common	.. ..	1,000 „
„ Medium Shrapnel	.. ..	400 „
„ Heavy Shrapnel	.. ..	600 „

SECTION 36.—SAFETY OF OTHER SHIPPING.

I. With shot and plugged shell.

Shipping within 1,000 yards range should be 15° clear of the line of fire for fear of a projectile breaking up in the bore. Shipping at more than 1,000 yards, but at a less range than the target, should be 5° clear of the line of fire.

Shipping at a greater range than the target should be $7\frac{1}{2}^\circ$ clear of the line of fire if range of target is over 2,000 yards, 10° clear if range is between 2,000 yards and 1,500 yards, and 15° clear if range is less than 1,500 yards.

II. With aiming rifles.

Shipping at a less range than the target should be 5° clear of the line of fire. When the target is at a less range than 1,500 yards, a 30° angle on either side of line of fire will be allowed for vessels at a greater

range than twice the range of the target. For vessels closer than this, but at a greater range than the target, 15° on each side of the line of fire will suffice.

Precautions are particularly necessary with aiming rifles, the bullets from which not only ricochet, but are liable to glance erratically off the target or tow rope.

III. With live shell.

As live shell may be blind, the rules for shot and plugged shell will be followed, with additional provisions for fear of shell bursting on second graze. Therefore vessels at a greater range than the target must be clear of the lines given by the aforementioned safety angles by the amounts given in Sect. 35 II for the various natures of ammunition mentioned. Vessels at less range than the target should be the same amounts clear of the 5° zone. Vessels outside a line 45° from the line of fire may be considered safe.

IV. For safety of other works, buildings, or inhabited land, lines of fire should have the same clearance as is laid down above for shipping.

SECTION 37.—RICOCHETS.

The following remarks with reference to ricochets will be found useful as a guide in estimating the safe limits for shipping as regards range when carrying out practice:—

Projectiles fired from mean sea level at angles of elevation of less than 4° almost invariably ricochet. These ricochets are quite irregular, and though frequently not more than 1,000 yards, are sometimes very great.

Projectiles having an angle of descent of 10° and upwards do not ricochet far over the water. Projectiles fired at 9° elevation seldom ricochet, and, when they do, the ricochet is never very long.

A safe rule for all angles of elevation at which guns mounted for coast defence are likely to be fired is:—

In the case of guns mounted at sea level, the range shall be clear to $R + \frac{1}{4}R$, where R is the range due to 9° elevation.

For guns mounted at a height above sea level the extreme ricochet will naturally be less.

The following table gives safe ranges for shipping for certain typical guns and charges. Safe ranges for other guns and charges must be worked out by the above rule.

TABLE 4.

Nature of Gun.	Limit of Range 10° and under.
10-inch B.L.	10,400
9·2-inch B.L., Mk. IX and X, full charge	14,500
9·2-inch B.L., Mk. IX and X, $\frac{3}{4}$ charge	11,300
6-inch B.L., Mk. VII, full charge	10,700
6-inch B.L., Mk. VII, $\frac{1}{2}$ charge	6,250
6-inch Q.F.	8,800
5-inch B.L.	6,600
4·7-inch Q.F., Mks. I to IV	7,800
4-inch Q.F., Mk. V.	8,600
12-pr. Q.F.	6,600
6-pr. Q.F.	5,400
1-inch Aiming Rifle	3,000
·45-inch Aiming Rifle	2,500
·23-inch Morris Ammunition	1,300

SECTION 38.—SAFETY IN BATTERY, &c.

The safety of gun detachments is best ensured by adhering strictly to the drill laid down for the service of the gun, and the general instructions for Gun Drill.

For instructions with reference to the discovery and destruction of unexploded shell on land or sea ranges after practice, see "Regulations for care and preservation of War Material and for Magazines."

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